

Survey of Biomedical Waste Management

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Abstract: *Biomedical waste management is an integral part of traditional and contemporary system of health care. We focuses on the identification and classification of Biomedical waste in Hospitals, Clinics, Pharmacy, Pathology Lab it's management and it's future prospective.*

The constituents of this type of waste are various and hazardous. Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016) Specify that every healthcare facility shall take all necessary steps to ensure that BMW is handled without any adverse effect on human and environmental health.

Then used colour coding and type of containers and labels for BMW containers or bags which should be non-washable and visible.

We aware in hospital, Pharmacy, pathology lab, to insect incineration process and used it. Because the incineration process safe and reduce the pollution

Keywords: Bio-medical waste, Bio-medical waste management, Segregation, Collection, Transportation, Disposal

I. INTRODUCTION

Waste means any useless, unwanted or discarded substance or material, irrespective of whether or not such substance or material has any other or future use. This includes any substance or material that is spilled, leaked, pumped, poured, emitted, emptied or dumped onto the land or into the water or ambient air. Waste generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals medical devices and radioactive materials. According to Biomedical Waste (Management and Handling) Rules, 2016 of India, 'biomedical waste' is defined as Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereof or in the production or testing of biological or in health camps.

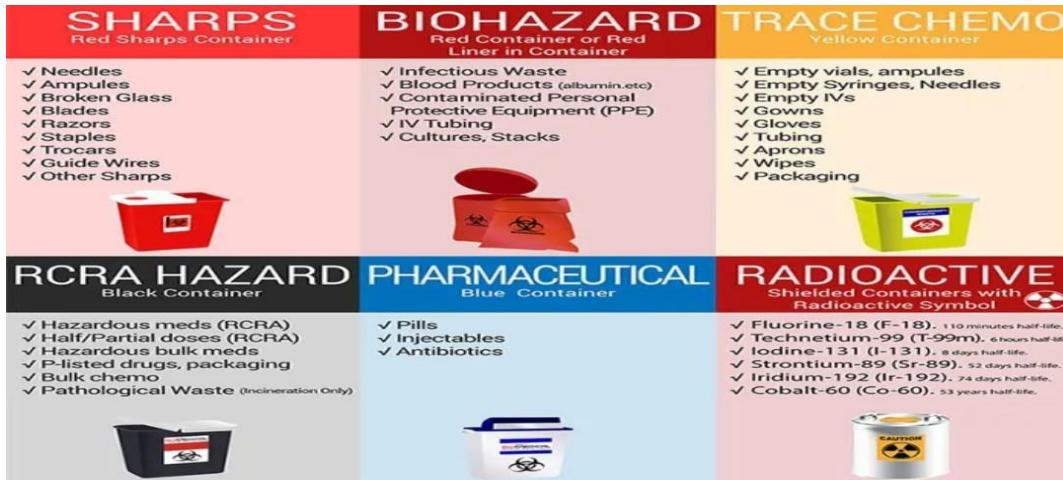
BMW management refers to completely removing all the hazardous and infectious waste generated from hospital settings. The importance of waste treatment is to remove all the pathogenic organisms by decontaminating the waste generated.[1]

According to a World Health Organization (WHO) report [2] large volume of hospital waste (around 85%) is non-infectious and 10% is infectious and the remaining 5% is hazardous- chemical, pharmaceutical or radioactive. [2] This 15% of waste generated from healthcare related activities needs special management and handling because it may include solid or liquid waste material that is potentially dangerous to those who come in contact with it.

However, if the infectious waste gets mixed with the non-infectious (general) waste, the entire bulk of healthcare waste potentially becomes infectious. [3]

In the year 1998, Government of India (Ministry of Environment and Forests 1998) issued Bio-medical Waste (Management and Handling) Rules. This rule was based on the principle of waste segregation at source followed by collection, transportation, storage, treatment and disposal of wastes according to their different categories. [4] Despite this formal notification, Bio-medical waste management has been consistently ignored by most of the healthcare facilities across India. [5-9] It is estimated that 0.33 million tonnes of bio- medical waste is generated in India, rate of generation of which ranges from 0.5 to 2 kg per bed per day. [10]

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OBJECTIVE AND GOALS

Awareness in Hospital, Pharmacy, Pathology lab to insert the Incineration machine

Destruction of Pathogens:

Incineration at high temperatures ensures the complete destruction of pathogens, including bacteria, viruses, and other microorganisms present in biomedical waste. This helps prevent the spread of infections and diseases

Volume Reduction:

Incineration reduces the volume of waste by converting it into ash and gases. This helps in managing the large quantities of waste generated by healthcare facilities and minimizes the need for storage and transportation.

Elimination of Sharps:

Incineration is an effective method for disposing of sharps, such as needles and syringes, which pose a significant risk of injury and infection if not properly managed. Incineration ensures their complete destruction.

Energy Recovery:

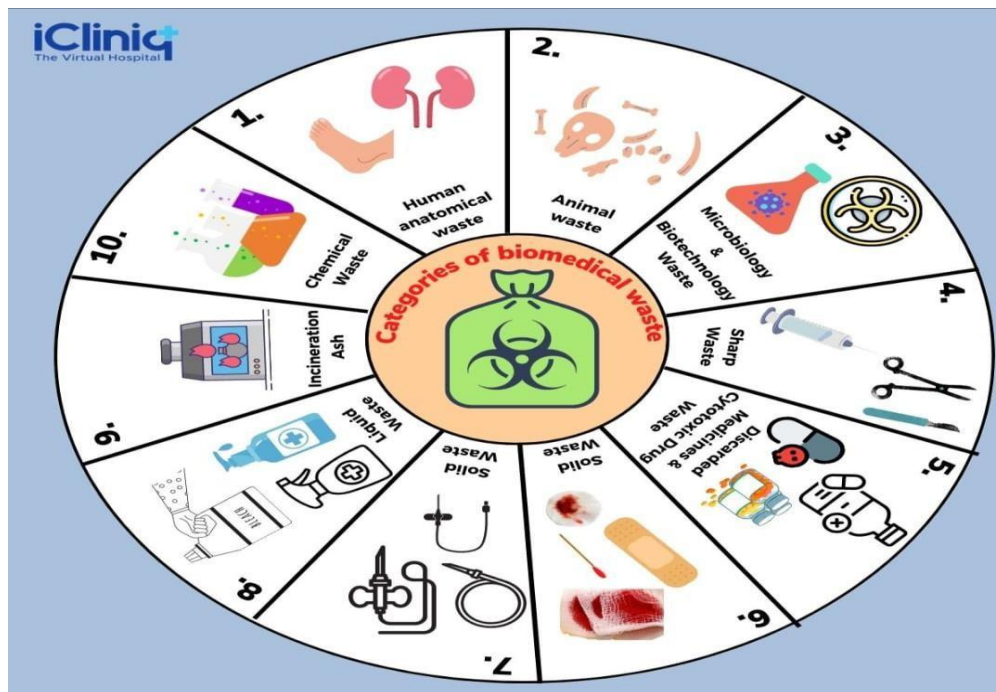
Incineration can also generate heat or electricity through waste-to-energy technologies. This allows for the recovery of energy from the incineration process, contributing to sustainable waste management practices.

Compliance with Regulations

TYPES OF BIOLOGICAL WASTE

Waste Category	Types of Waste
Category 1	Human Anatomical Waste: (Anatomical waste is any waste products containing human (or animal) tissue, blood, or body parts. It's also referred to as pathological waste and often arises because of surgery, autopsy, research /investigation, and other kinds of treatment.)
Category 2	Animal Waste: (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses)
Category 3	Microbiology & Biotechnology Waste: (Wastes from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biological, toxins, dishes and devices used for transfer of cultures)
Category 4	Waste Sharps: (Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)
Category 5	Discarded Medicine and Cytotoxic drugs: (wastes comprising of outdated,

	contaminated and discarded medicines)
Category 6	Soiled Waste: (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines beddings, other material contaminated with blood)
Category 7	Solid Waste: (Wastes generated from disposable items other than the waste [sharps] such as tubings, catheters, intravenous sets etc.)
Category 8	Liquid Waste: (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities)
Category 9	Incineration Ash: (ash from incineration of any bio-medical waste)
Category 10	Chemical Waste: (Chemicals used in production of biomedical, chemicals used in disinfection, as insecticides etc.)



SOURCES

- Government hospital
- Private hospitals
- Medical Shop
- Pathology
- Industry

QUESTIONS

Questions for Pharmacy.

1. What type of waste, is pharmaceuticals?
2. How do you manage pharmaceutical waste?
3. What waste is the need of medical management?
4. Which method is suitable for medical waste disposal?
5. What is medical waste called?
6. Which bin is used for pharmaceutical waste?

7. What are the pharmaceutical waste materials?
8. What is the role of pharmacist in waste disposal?
9. How can we reduce waste in pharmaceutical industry?
10. Pharmaceutical waste is are hazardous?
11. You can used incineration process?
12. You know Incineration process?
13. What is incineration process?

Question for Pathology lab.

1. How do you, dispose of waste.in a pathology lab?
2. What are the waste management in the laboratory?
3. What are main types of waste generated in a lab?
4. What is pathological waste management?
5. What is type of laboratory waste?
6. What is hazardous waste in laboratory?
7. What are the colours of waste bin in laboratory?
8. What is waste management plan in the lab?
9. You can used incineration process?
10. You know incineration process?
11. Incineration process is more economical?

Questions for Hospital.

Which type of wastes are biomedical wastes?

- A) Waste from industries B) Waste from hospitals
C) Waste from communities D) All of the above

Biomedical waste are hazardous waste yes or no Yes No

Yes B) No

Why are biomedical wastes so dangerous?

- A) They expose us to disease B) They are infectious
C) They are gotten form hospital D) None of the above

What are sharp?

- A) Biomedical waste B) Hazardous waste
c) Industrial waste D) None of the above

How are used syringes and cotton wool disposed?

- A) Off side B) On side

What does the poor disposal biomedical waste cause?

- A) Infectious diseases B) Medical issues C) Allergies

How to management the Biomedical waste in the hospital?

Which of these explains biomedical Waste management?

What are the major types of hospital waste?

How biomedical waste is treated in a hospital?

Which method is used for biomedical waste management?

How is biomedical waste classified?

Which dustbin is used for biomedical waste?

What is the purpose of biomedical waste?

Which colour is general waste bin?

Which colour bin is for paper?

You can used the incineration process?

INCINERATION

Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. Industrial plants for waste incineration are commonly referred to as waste-to-energy facilities. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas and heat. The ash is mostly formed by the inorganic constituents of the waste and may take the form of solid lumps or particulates carried by the flue gas. The flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere. In some cases, the heat that is generated by incineration can be used to generate electric power.

Incineration with energy recovery is one of several waste-to-energy technologies such as gasification, pyrolysis and anaerobic digestion. While incineration and gasification technologies are similar in principle, the energy produced from incineration is high- temperature heat whereas combustible gas is often the main energy product from gasification. Incineration and gasification may also be implemented without energy and materials recovery.

In several countries, there are still concerns from experts and local communities about the environmental effect of incinerators (see arguments against incineration).

In some countries, incinerators built just a few decades ago often did not include a materials separation to remove hazardous, bulky or recyclable materials before combustion. These facilities tended to risk the health of the plant workers and the local environment due to inadequate levels of gas cleaning and combustion process control. Most of these facilities did not generate electricity.

Incinerators reduce the solid mass of the original waste by 80-85% and the volume (already compressed somewhat in garbage trucks) by 95-96%, depending on composition and degree of recovery of materials such as metals from the ash for recycling. This means that while incineration does not completely replace landfilling, it significantly reduces the necessary volume for disposal. Garbage trucks often reduce the volume of waste in a built-in compressor before delivery to the incinerator. Alternatively, at landfills, the volume of the uncompressed garbage can be reduced by approximately 70% by using a stationary steel compressor, albeit with a significant energy cost. In many countries, simpler waste compaction is a common practice for compaction at landfills.

Incineration has particularly strong benefits for the treatment of certain waste types in niche areas such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures. Examples include chemical multi-product plants with diverse toxic or very toxic wastewater streams, which cannot be routed to a conventional wastewater treatment plant.

Waste combustion is particularly popular in countries such as Japan, Singapore and the Netherlands, where land is a scarce resource. Denmark and Sweden have been leaders by using the energy generated from incineration for more than a century, in localised combined heat and power facilities supporting district heating schemes. In 2005, waste incineration produced 4.8% of the electricity consumption and 13.7% of the total domestic heat consumption in Denmark. A number of other European countries rely heavily on incineration for handling municipal waste, in particular Luxembourg, the Netherlands, Germany, and France.



II. METHODOLOGY

Data collect from 1 Government Hospital, 2 Private Hospital, 3-4 Pharmacy, Ayurveda Clinics are used to identify the type of waste the amount of waste generated and the which disposal technique follow. We make some questions about the waste management and asking to them in survey. Awareness to insert incineration process

- **Segregation:** Segregate the biomedical waste into different categories, such as infectious waste, sharps, pathological waste, etc. This helps ensure proper handling and treatment.
- **Collection:** Collect the segregated waste in appropriate containers that are leak-proof and labeled correctly. Use separate containers for each category of waste. Bio medical waste, in addition to the risk for patients and medical personnel, also poses a threat to public health and environment. To assess the existing Knowledge and Practice of BMW among the general practitioners in Kanchipuram town, a Descriptive Cross sectional study was conducted using pre-tested structured questionnaire.
- **Incineration Facility:** Send the collected waste to a licensed incineration facility that follows all environmental and safety regulations. These facilities have specialized equipment for waste incineration.
- **Incineration Process:** The waste is fed into the incinerator, where it is subjected to high temperatures. The heat generated during incineration helps destroy pathogens and reduce the volume of waste.
- **Emission Control:** Incineration facilities have pollution control systems to minimize the release of harmful gases and pollutants into the atmosphere. These systems include filters and scrubbers
- **Ash Disposal:** After incineration, the remaining ash is collected and disposed of in accordance with local regulations. Ash may be sent to a landfill or undergo further treatment if required.

Technology has allowed ash to have great uses after the incineration process. Ash can be used as the underlay for new roads, used in concrete for construction and even used as a fertilizer if the waste is organic.

BENEFITS OF PROPER BIOMEDICAL WASTE MANAGEMENT

- Protecting the health of healthcare workers, the public, and the environment
- Preventing the spread of infectious diseases.
- Reducing the risk of contamination of the environment.
- Protecting workers from exposure to hazardous materials.
- Reducing the cost of healthcare

III. CONCLUSION

BMW is generated by healthcare facilities and can be hazardous and infectious. Improper handling can lead to health hazards. Collection, segregation, transportation, treatment, and disposal of BMW are important steps in its management. The color coding of bins, the use of technologies such as incineration and autoclaving, and attention to environmental impacts are also highly crucial. BMW management aims to reduce waste volume and ensure proper disposal. All those involved should strive to make the environment safer

REFERENCES

- [1] "Biomedical Waste Management: A Review" by P. K. Gupta and Shishir Kumar:
- [2] Pruess A, Giroult E, Rushbrook P. Safe management of waste from health care activities. Geneva, Suisse: World Health Organization: 1999. [Cited 2012 august 4].
- [3] Info Nugget. Hospital Waste Management and Bio-degradable Waste. Delhi: Government of India, Press Information Bureau; 2003 [Cited 2014 February 6. Available from: <http://pib.nic.in/infonug/infaug.99/i3008991.html>.
- [4] Bio-Medical Wastes (Management and Handling) Rules: Gazette by Govt. of India (1998/2000).
- [5] Akter N, Chowdhury AMR, Kazi NM. Hospital Waste Disposal in Bangladesh with Special Reference to Dhaka City and its Environmental Evaluation. International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). 1999 February; Special Publication No. 87.

- [6] Singh A, Zaidi J, Ganesh S, Chauhan VS, Mehrotra M. Status of biomedical waste and their possible public health risks with controlling measures in the Jhansi city, Bundelkhand region, India: a case study. *International Journal of Current Research*. 2011 October; 080- 086.
- [7] Mathew SS, Benjamin AI, Sengupta P. Assessment of biomedical waste management practices in a tertiary care teaching hospital in Ludhiana. *Health line*. 2011 July- December; Volume 2, Issue 2.
- [8] Radha KV, Kalaivani K, Lavanya R. A case study of Biomedical Waste Management in Hospitals. *Global Journal of health Sciences*. 2009 April; Volume 1, No. 1.
- [9] Joseph J, Krishnan ACG. Hospital waste management in the union territory of Pondicherry an exploration. Govt. of Pondicherry Institution, Pondicherry- 605006. 2004.
- [10] Patil AD, Shekdar AV. Healthcare waste management in India. *J Environ Manage*. 2001; 63: 211-20.
- [11] Biomedical Waste in Laboratory Medicine : Audit and Manegement By V Chitnis,K Vaidya,*D Chitnis(2005)23(1):6-13
- [12] Knowledge and practice of Biomedical Waste (BMW) Manegement By Kokila Selvaraj,P.Sivaprakasam, B.T.Sudhir Ben Nelson,G.H.Midhun Kumar,* Prasan Norman and K.R.Pandiyam Volume 2 Number 10 (2013) pp,262-267
- [13] Biomedical Waste Management in Ayurveda Hospital - current practices and future prospective by Renju Rajan,Delvin T. Robin* Vandananarani M (2017)
- [14] Pruss A, Giroult E and Rushbrook P. (1999) Safe Management of Wastes from Health Care Activities, World Health Organization, Geneva
- [15] Kishore J and Ingle G.K. (2004) Biomedical Waste Management in India, Century Publications, New Delhi
- [16] Srishti - Managing Hospital Waste, a Guide for Healthcare Facilities, September 2000.
- [17] Agarwal, A.G. and Singh, R. (2005) Understanding and Simplifying Bio- Medical Waste Management, Toxics Link, New Delhi Mandal.
- [18] S. K & Dutta J, Integrated Bio-Medical Waste Management Plan for Patna City, Institute of Town Planners, India Journal 6-2:01-25 (2009).
- [19] The Bio Medical Waste (Management & Handling) Rules, (1998) & (2011).
- [20] WHO - Healthcare Waste Management
- [21] NRHM-Infection management & environment plan. Policy framework march 2007. Ministry of Health & Family Welfare, Government of India.
- [22] Biomedical waste rules made stringent. 2012.